such reduced-count designs may be further investigated for confirming whether or not they are practical or viable in a modern turbofan engine.

While there have been described herein what are considered to be preferred and exemplary embodiments of the present invention, other modifications of the invention shall be apparent to those skilled in the art from the teachings herein, and it is, therefore, desired to be secured in the appended claims all such modifications as fall within the true spirit and scope of the invention.

Accordingly, what is desired to be secured by Letters Patent of the United States is the invention as defined and differentiated in the following claims in which we claim:

The invention claimed is:

1. A fan for a gas turbine engine comprising:
an annular casing;
a disk disposed coaxially inside said casing and including a row of fan blades extending radially outwardly from a perimeter rim thereof;
each of said blades including an airfoil having circumferentially opposite pressure and suction sides extending radially in span from a root to a tip, and extending axially in chord between opposite leading and trailing edges, with said airfoils defining corresponding flow passages therebetween for pressurizing air;
each of said airfoils including stagger increasing between said root and said tip to position the leading edge of one airfoil circumferentially adjacent to the suction side of the next adjacent airfoil to define a mouth for said flow passage therebetween, with said flow passage converging to a throat aft from said mouth; and
said row including no more than twenty and no less than eighteen of said fan blades having a solidity defined by the ratio of said airfoil chord over the circumferential pitch and being low in magnitude at said tips and no greater than about 1.2 and greater than about 1.0 to position the leading edge of each tip circumferentially near the trailing edge of the next adjacent tip.

2. A fan according to claim **1** wherein:
said airfoil stagger positions the trailing edge of one airfoil circumferentially adjacent to the pressure side of the next adjacent airfoil to define an outlet for said flow passage therebetween; and
said airfoil tips vary in width between said leading and trailing edges to converge said flow passage from said mouth to said throat and diverge said flow passage from said throat to said outlet.

3. A fan according to claim **2** wherein said airfoils include forward aerodynamic sweep at said tips thereof.

4. A fan according to claim **3** wherein said converging-diverging flow passages at said airfoil tips are sized and configured for receiving supersonic flow of said air at said leading edges, followed by shock therein, and with subsonic diffusion aft from said throat.

5. A fan according to claim **4** wherein said tip solidity includes the ratio of chord over diameter having a value to provide a circumferential gap between said leading and trailing edges of adjacent tips.

6. A fan according to claim **5** further comprising:
a smooth annular tip shroud mounted inside said casing and surrounding said airfoil tips, and positioned closely adjacent thereto to define a correspondingly small tip clearance therewith; and
a row of outlet guide vanes extending radially inwardly from said casing and spaced aft from said blade row, and being more than twice in number than said fan blades for reducing noise from said fan.

7. A fan according to claim **6** wherein:
said blade row includes only twenty fan blades; and
adjacent airfoils have said circumferential gap near said tips, followed radially inwardly by circumferential overlap therebetween, and further followed radially inwardly by a circumferential gap near said roots.

8. A fan according to claim **7** wherein said solidity at said tips is about 1.17.

9. A fan according to claim **6** wherein:
said blade row includes only eighteen fan blades; and
said circumferential gap between adjacent airfoils extends from root to tip thereof.

10. A fan according to claim **9** wherein said solidity at said tips is about 1.05.

11. A fan for a gas turbine engine comprising:
an annular casing;
a disk disposed coaxially inside said casing and including a row of fan blades extending radially outwardly from a perimeter rim thereof;
each of said blades including an airfoil having circumferentially opposite pressure and suction sides extending radially in span from a root to a tip, and extending axially in chord between opposite leading and trailing edges, with said airfoils defining corresponding flow passages therebetween for pressurizing air;
each of said airfoils including stagger increasing between said root and said tip to position the leading edge of one airfoil circumferentially adjacent to the suction side of the next adjacent airfoil to define a mouth for said flow passage therebetween, with said flow passage converging to a throat aft from said mouth; and
said row including no more than twenty of said fan blades having a solidity defined by the ratio of said airfoil chord over the circumferential pitch and being low in magnitude at said tips to position the leading edge of each tip circumferentially near the trailing edge of the next adjacent tip and correspondingly increase the width of said throat.

12. A fan according to claim **11** wherein said tip solidity is low in magnitude to provide a circumferential gap between said leading and trailing edges of adjacent tips.

13. A fan according to claim **12** wherein:
said airfoil stagger positions the trailing edge of one airfoil circumferentially adjacent to the pressure side of the next adjacent airfoil to define an outlet for said flow passage therebetween; and
said airfoil tips vary in width between said leading and trailing edges to diverge said flow passage therebetween.

14. A fan according to claim **13** wherein said airfoils include forward aerodynamic sweep at said tips thereof.

15. A fan according to claim **14** further comprising:
a smooth annular tip shroud mounted inside said casing and surrounding said airfoil tips, and positioned closely adjacent thereto to define a correspondingly small tip clearance therewith; and
a row of outlet guide vanes extending radially inwardly from said casing and spaced aft from said blade row, and being more than twice in number than said fan blades for reducing noise from said fan.

16. A fan according to claim **15** wherein said airfoil tips have an axially arcuate contour, and said tip shroud has a complementary axially arcuate contour for maintaining a substantially uniform tip clearance radially therebetween and axially between said leading and trailing edges.

17. A fan according to claim **14** wherein:
said solidity includes the ratio of chord over diameter; and